Introduction to Futron

Joseph Fuller, President & CEO

Mr. Fuller is the founder and President of Futron Corporation. He started Futron in 1986 after recognizing the need for improved performance and better integrated solutions to problems involving technology, management and people. The result is an enterprising company focusing on technology as a strategic element of an organization's business strategy. The company is an innovator in developing systems solutions to technology management challenges in a rapidly changing world. Its mission is to make technology work for the strategic and competitive advantage of its clients.

Mr. Fuller began his career at the National Aeronautics and Space Administration where he spent 20 years as an aerospace systems engineer, project manager, and senior executive. He is experienced in the design, development, and operations of human-piloted and robotics spacecraft. Space programs to which he has been a contributor include Gemini, Apollo, Skylab, Space Shuttle, TIROS/NOAA, and Space Station.

Mr. Fuller was a Charter Member of the Federal Senior Executive Service and a recipient of the NASA Exceptional Service Medal. A Houston, Texas native, he received a Bachelor of Science degree in Physics from Texas Southern University, and a Masters in Business Administration from the University of Houston.

The name Futron is the union of two words:

future and -tron (the Greek suffix for ‘instrument’) making us literally the

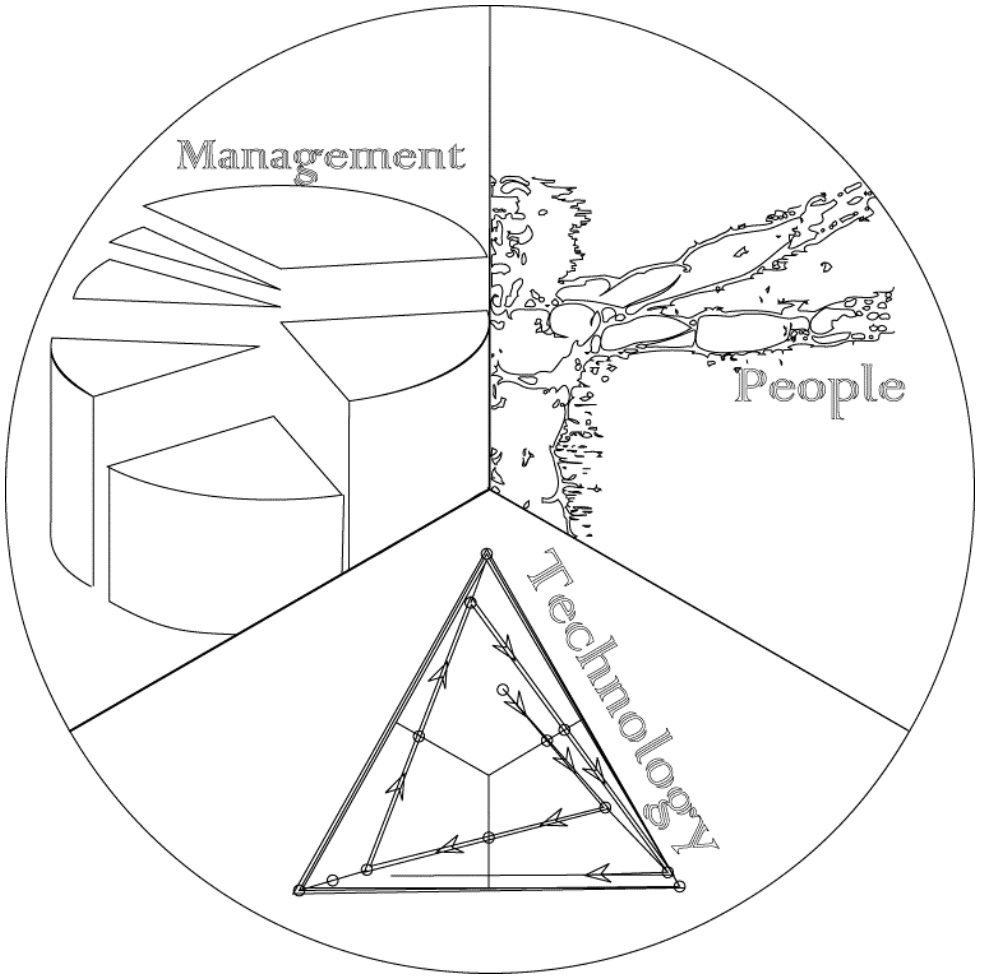
“instrument of the future”

About the Corporation

A system engineering and technology management firm...

Making technology work...

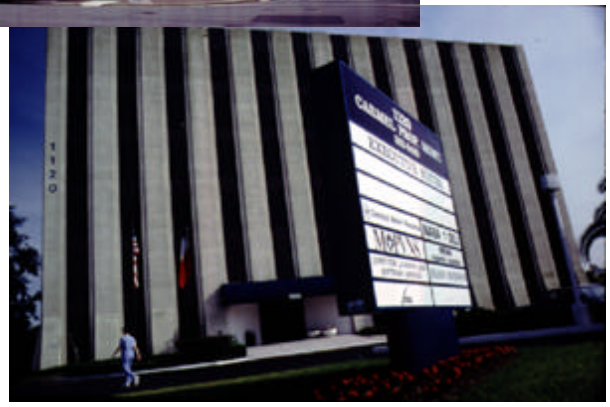
To confront the challenges of the future



Corporate Background

- **Founded by President Joseph Fuller, Jr. in 1986**
- **Headquartered in Bethesda, MD**
- **Offices in Washington, DC and Houston, TX**
- **Top Secret Clearance**
- **ISO 9000 Implementation**

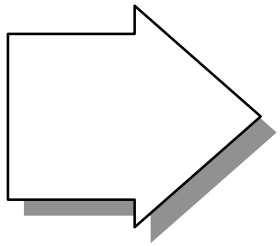
Futron's headquarters are in Bethesda, Maryland (top) with offices in Washington, DC (center) and Houston, TX (bottom)



Futron Skills and Competencies

Skills

- Advanced technology knowledge & experience
- Technical systems analysis
- Process innovation
- Information management
- Management systems analysis
- Risk-based decision support
- Communications and outreach



Competencies

- Understanding the dynamics of research and technology enterprises
- Developing and implementing cost-effective technology management strategies
- Transforming data into useful information for decision-makers

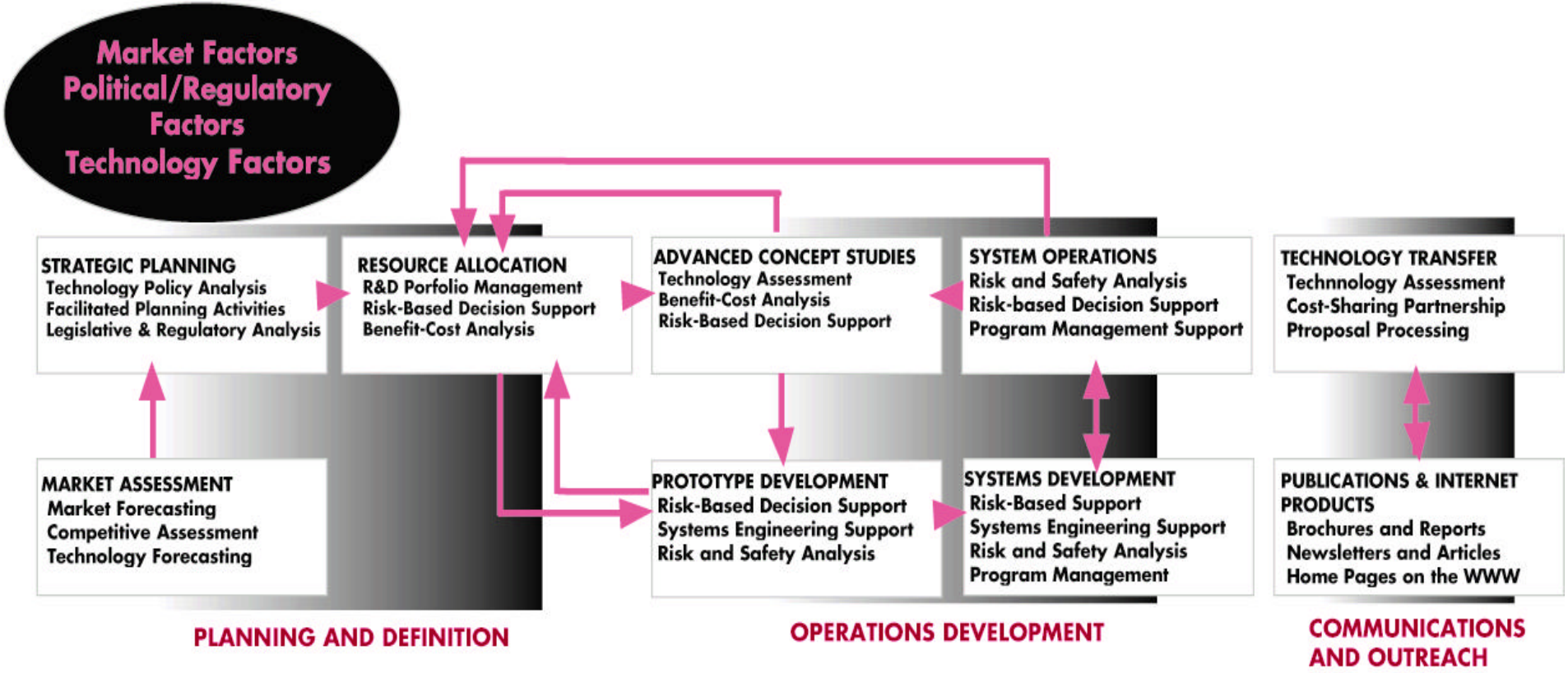
What does Futron do for our customers?

- Deliver creative "out of the box" problem solving
- Bring a strategic value-focused business perspective
- Apply cutting-edge analytical methods and tools
- Leverage knowledge, skills, and competence
- Act as an independent honest broker
- Generate results that pay for services many times over

Technology Management Consulting Services

Business Planning & Market Analysis	Research & Technology Management	Program Management
Technology Policy	System Architecture Analysis	System Safety & Reliability
Market Forecasting	Requirement Analysis	Failure Modes, Effects, & Criticality Analysis
Economic Impact	Technology Assessment/Transfer	Risk Management/Decision Support
Cost Benefit	R&D Portfolio Management	System Analysis
Regulatory Analysis	System Modeling & Simulation	Management Systems
Organization Effectiveness	**Strategic Information Management**	**Communications & Outreach**
Organization Assessment	Information Resource Management	Communications
Strategic Management & Process Innovation	Architecture/Design	Promotions
Change Management & Organization Transformation	Information Management Systems	Publications
Performance Measurement	Information Security Analysis	INTERNET Products
Business Process Reengineering	Data Management	Exhibits

R&T Life Cycle Services



Futron provides an array of services that span the life cycle of research and technology activities

Typical Clients

Aerospace Industry

Applied Physics Laboratory
Boeing Defense and Space Group
Kaman Sciences Corporation
Lockheed Martin Corporation
Science Applications Int'l Corporation

NASA

Headquarters
Ames Research Center
Goddard Space Flight Center
Johnson Space Center
Lewis Research Center
Marshall Space Flight Center

Other Clients

Department of Defense
Department of State
Department of Transportation
Federal Aviation Administration
National Institute of Standards and Technology

International

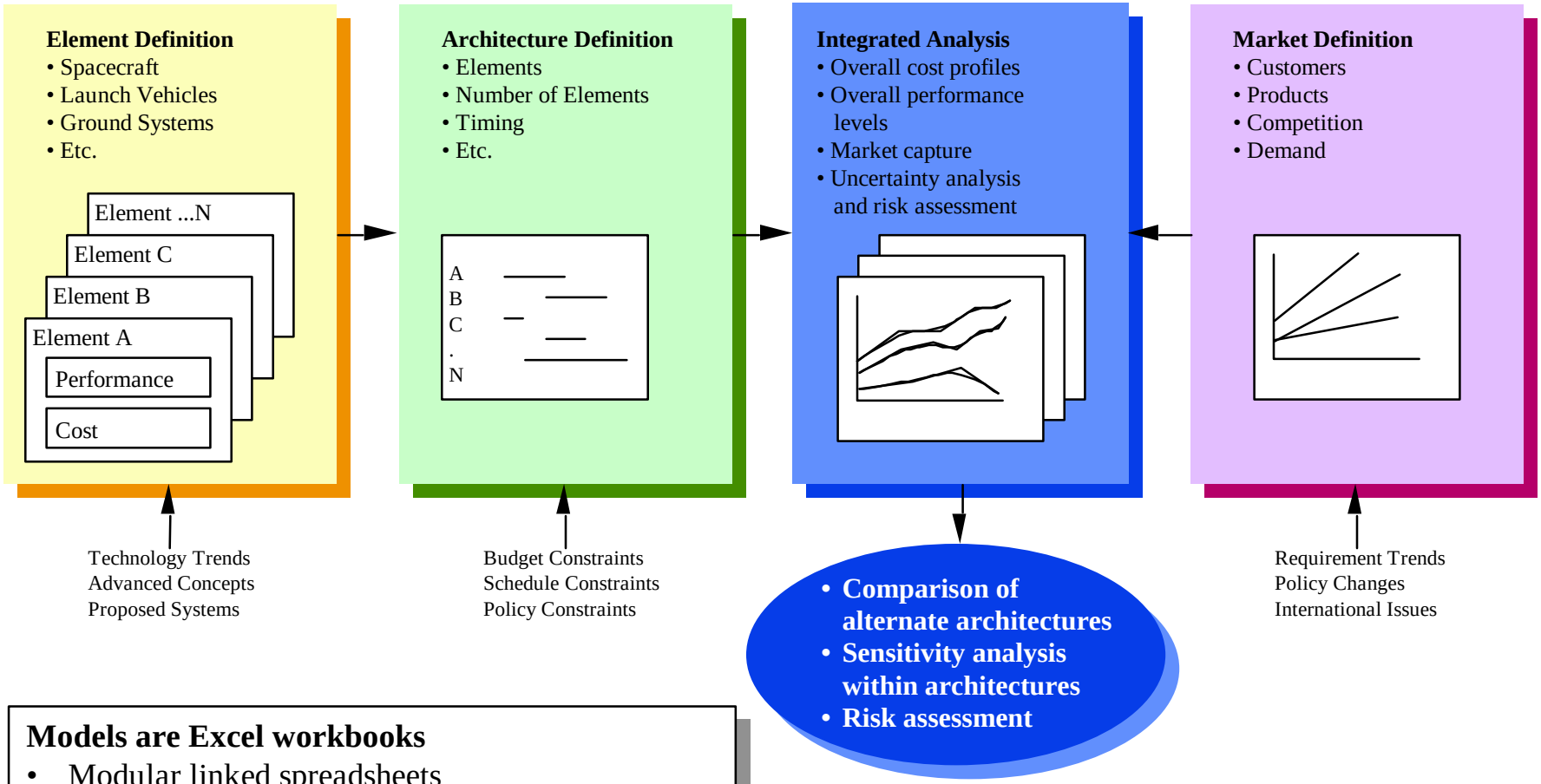
Technologies Aerospatiales (France)
Ishikawajima-Harima Heavy Industries (IHI) (Japan)
Volvo Corporation (Sweden)
Biosystems Life Sciences International
Canadian Space Agency

Selected Futron Capabilities

- Advanced Concept Modeling
  - Integrated analysis of systems of systems, providing big picture insights that enable better technology planning and decision making
- Research & Development Portfolio Management
  - Developing and implementing methods for maximizing the benefits of R&D investments
- Risk-Based Decision Support (RBDS)
  - Balancing risk across program elements including safety, performance, cost, schedule, reliability, and availability

Futron is working to solve the challenges facing advanced technology organizations in transportation, aerospace, and defense

Generalized Approach to Advanced Concept Modeling



Models are Excel workbooks

- Modular linked spreadsheets
- Architecture elements are modules
- Visual feedback on key parameters & outputs

System Modeling Benefits

- Quick, traceable, integrated end-to-end system architecture simulation
- Sensitivity analyses among input variables related to architecture elements and marketplace
- Rapid option assessment supports architectural concept refinement and architecture comparison
- Accommodates architecture attributes of technologies and applications to markets
- Accommodates alternative government, industry role scenarios
- Addresses uncertainty explicitly, producing distributions rather than point estimates

Lets decision makers consider the value of a particular technology based on its relative impact on overall architecture characteristics

Advanced Concept Applications

- NASA Space Solar Power (SSP) Study
  - Integrated Architecture Assessment Model (IAAM) analyzes performance & markets for SSP deployment & operations
  - Assessed the economic feasibility of 17 architectures, identifying 3 with the most promise
  - Conducted sensitivities on key technologies and system attributes that were used to identify 8 critical technology development needs
- NASA Highly Reusable Space Transportation (HRST) Study
  - Integrated Launch Architecture and Market Model (ILAMM) indicates commercial venture architectural concept viability for alternate architectural configurations and market forecast assumptions
  - Used as a common tool in the integration task force to consistently analyze all benchmark architectures including SSTO, launch assist, and air-breathing propulsion
  - Used to conduct sensitivities on key drivers such as vehicle life, operational thresholds, market forecasts, design margins & operability vs. performance, and degree of system reusability

Integrated Launch Architecture and Market Model (ILAMM)

SUMMARY COST PARAMETERS

% of Non-Rec privately	80%
Reference Price [$/kg]	1200.0 [$/kg]
Increment for Chart	9%
IRR at Ref Price (High Prob.)	4.95%
IRR at Ref Price (Med. Prob.)	10.72%
IRR at Ref Price (Low Prob.)	29.09%
Orbital Vehicle COSTS	
Launch Cost [$/kg p/l]	$149.34
LV H/W Cost [$/kg p/l]	$37.21
Prop Cost [$/kg p/l]	$10.52
Operations Cost [$/kg p/l]	$49.12
Percent H/W Expended	0.100%
H/W Cost [$/kg]	$10,000
Propellant Cost [$/kg]	$0.30
Labor Cost [$/hr]	$60
Labor Hours [hr/flt/kg]	0.2000

GO to Performance Summary Sheet

GO to Model Introduction

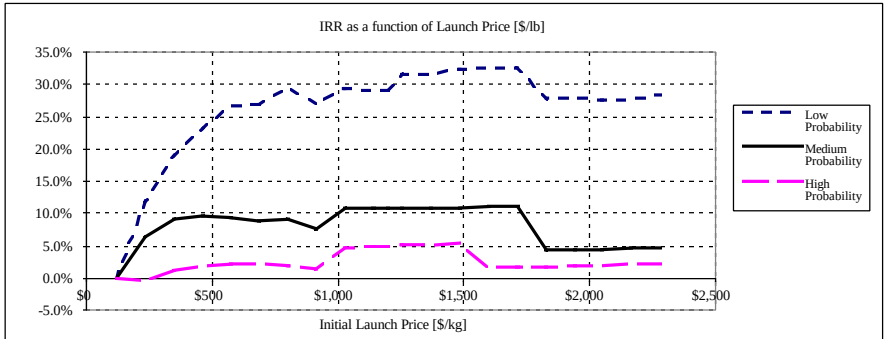
GO to Market Summary Sheet

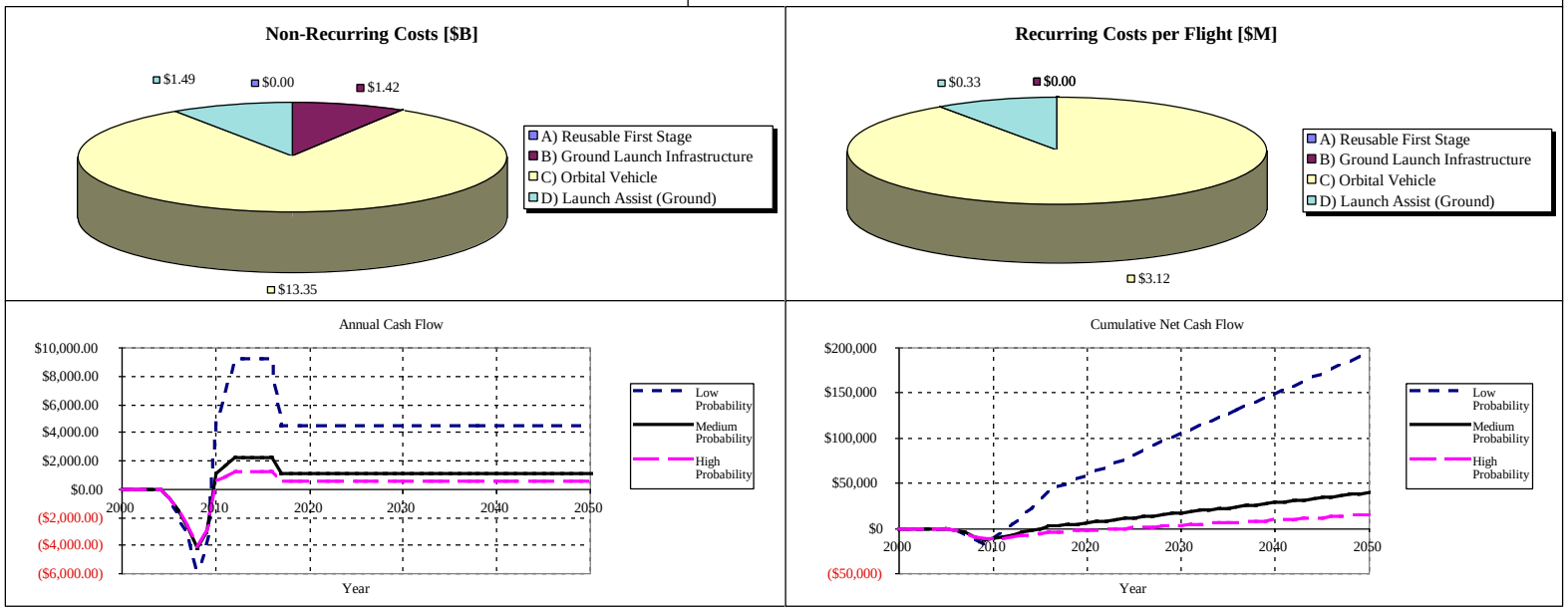
GO to A) Reusable First Stage

GO to B) Ground Launch Infrastructure

GO to C) Orbital Vehicle

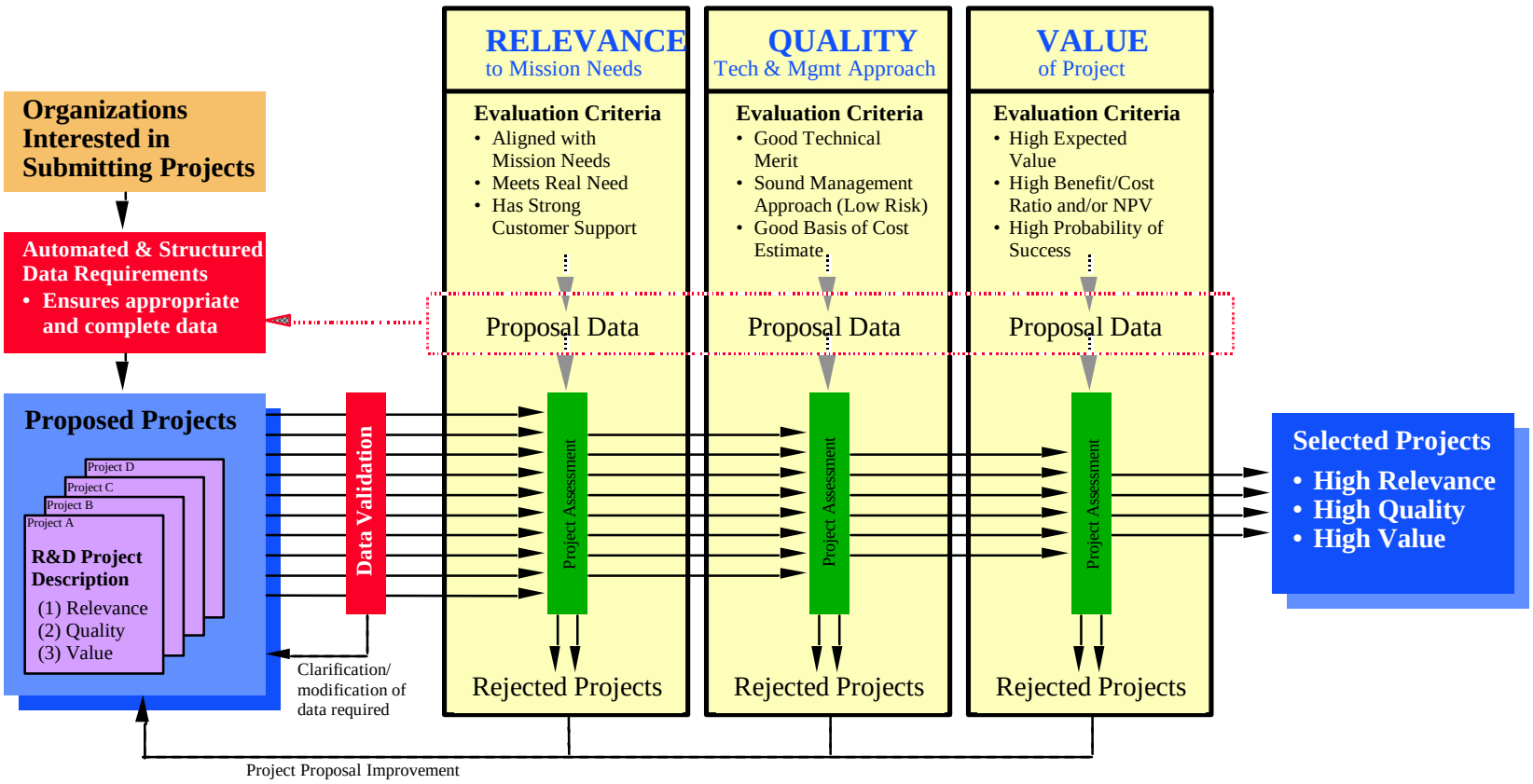
GO to D) Launch Assist (Ground)





- Integrates price-driven dynamic market model with vehicle architecture - cost, performance & operations
- Provides insight into pricing strategy and business outlook - generates IRR as a function of price

R&D Decision Support Process



Futron has developed R&D processes that are linked to strategic objectives for improving R&D outcomes

R&D Decision Support Benefits

- More focused R&D activities
  - Establishes and communicates context for research
  - Alignment with strategic objectives
  - Allows proposers to understand research goals and focus proposal efforts
- Greater returns for R&D investments
  - Decision process improves portfolio to select R&D investments with greatest potential
  - Analysis of benefits of research aids in showing value of additional resources
  - Identifies projects with best potential for high value returns
- Leveraging R&D investments
  - Multiple applications of developed technology through a robust technology management infrastructure
- Justifiable spending decisions
  - Traceable, credible process
  - Increased quantification of expected benefits

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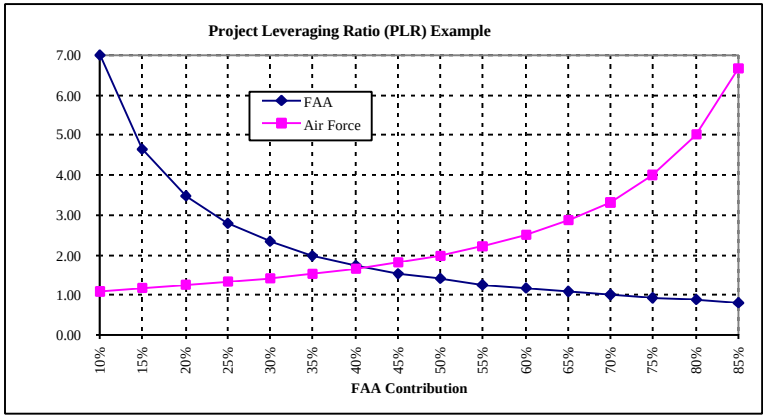
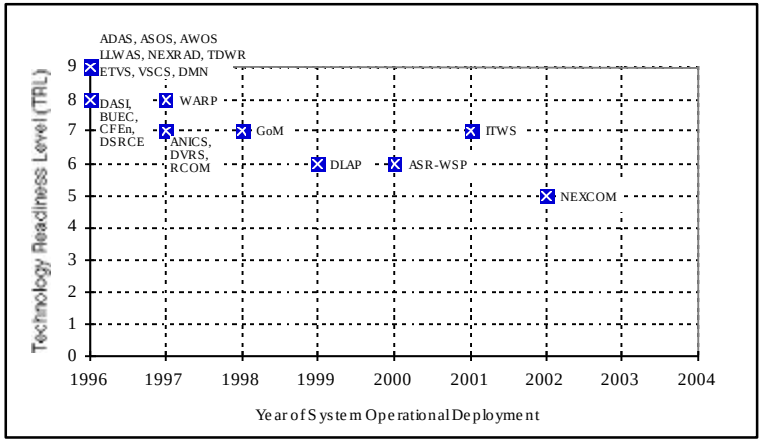
FAA R&D Portfolio Management

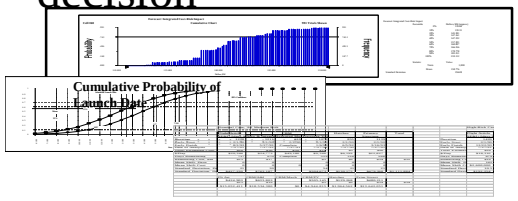
- Resource leveraging study to address declining R,E&D budgets with increasing requirements
  - Developed resource leveraging opportunity analysis concepts
  - Identified additional resource leveraging opportunities
- Study of FAA R,E&D Programs, Technology Development, and the NAS Architecture
  - Identified NAS Architecture-defined needs not being addressed
  - Mapped technology requirements to activities, introduced the use of technology maturity indices to FAA R,E&D planning
  - Identified relevant external research activities (e.g., foreign, DoD)

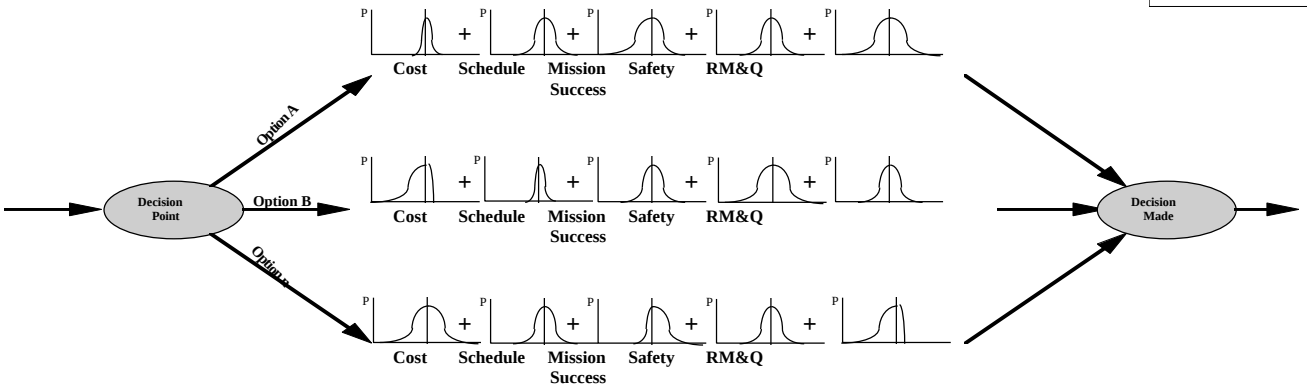




Risk-Based Decision Support (RBDS)

- **Project management** methodology to execute:
  - Risk identification
  - Risk analysis
  - Risk mitigation
  - Risk action tracking
  - Legacy capture
- Critical element of Project Manager's decision support system
- Quantitative, predictive, experience-based





Making decisions that achieve an optimal balance among competing program risks

RBDS Benefits

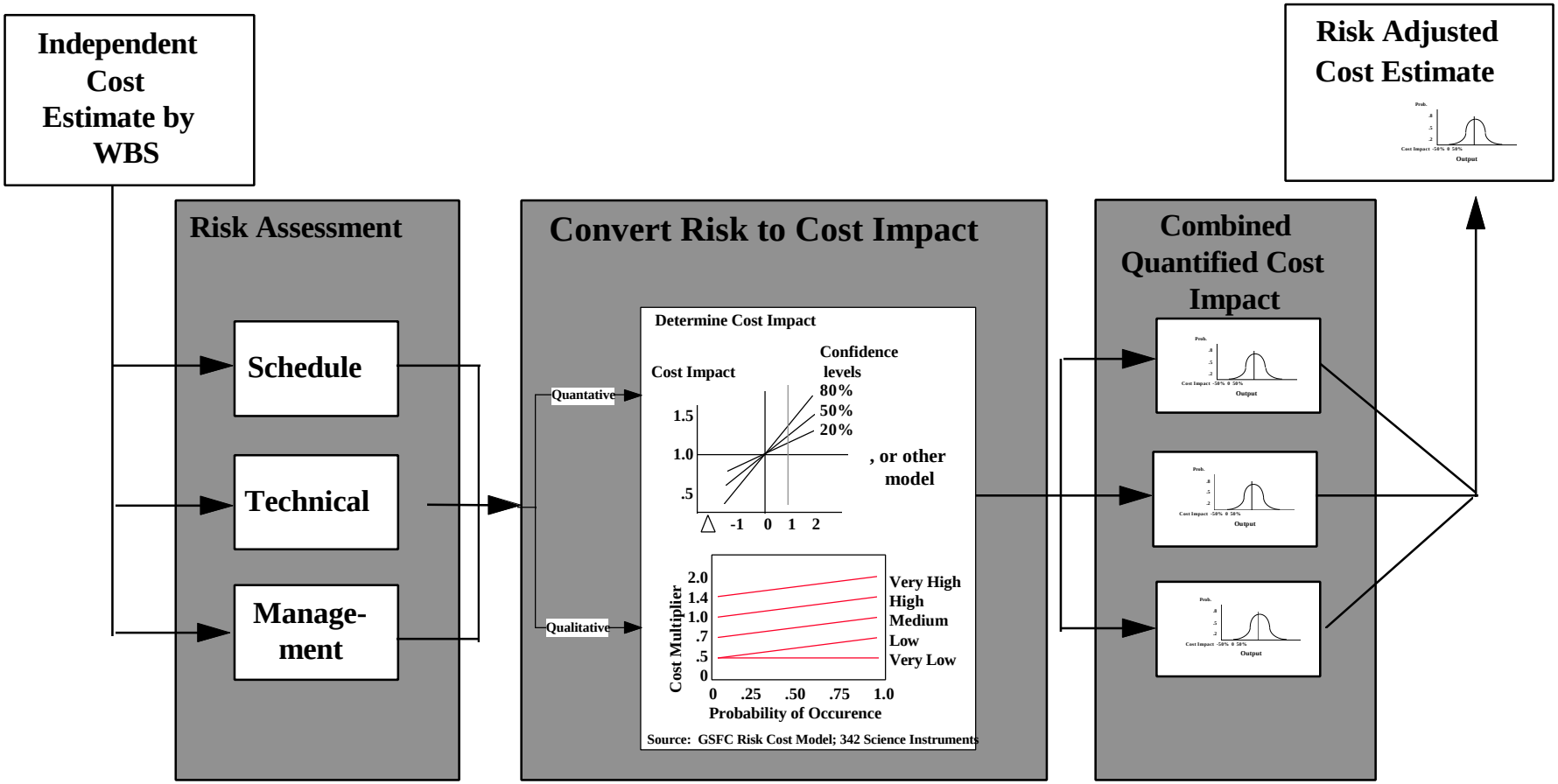
- Quantitative prediction of future cost, schedule, performance & safety results
- Experience-derived basis for improved decisions
- Traceable, quantitative decision impact assessment
- Consistent decision basis, comprehensible internal & external decision legacy
- More certain cost, schedule, performance management

How to live close to the margin without going over the edge

RBDS Applications

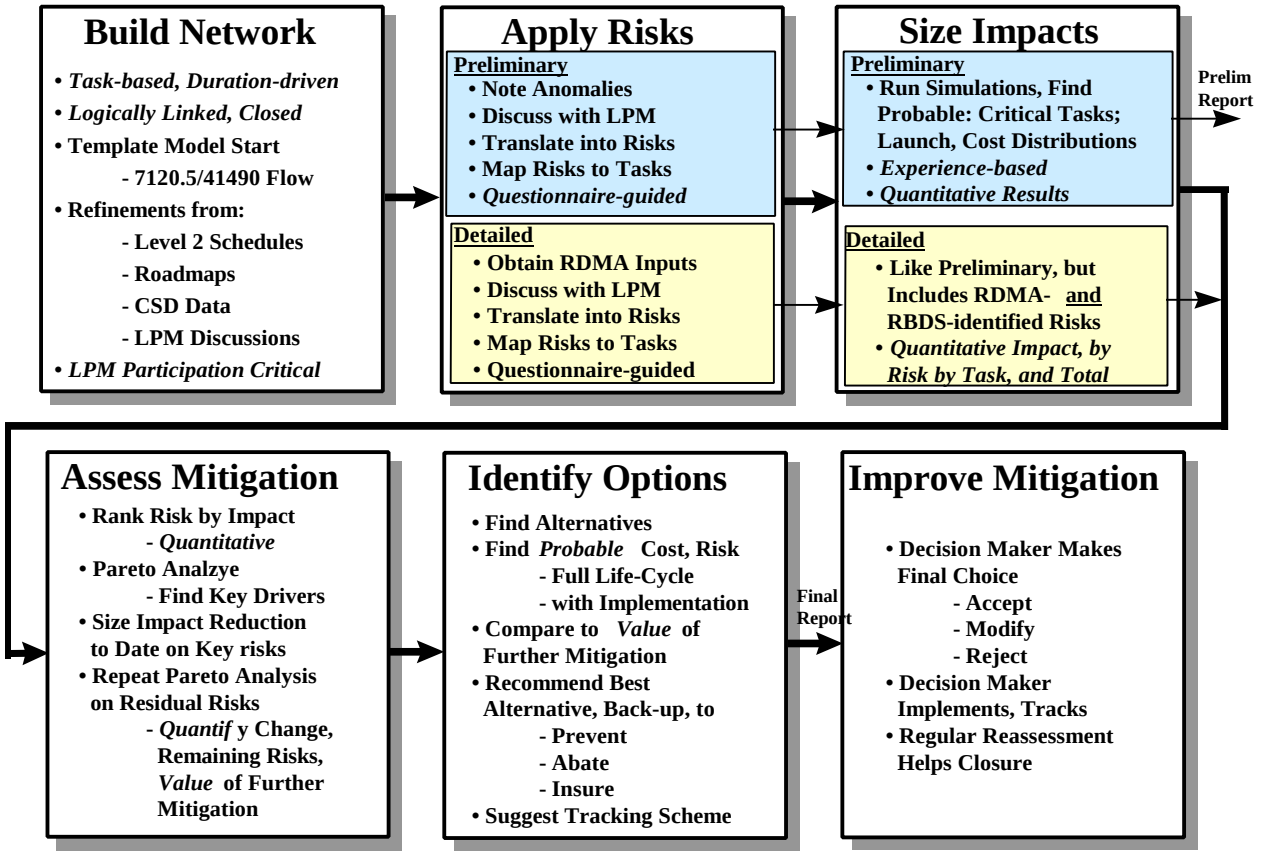
- NASA ARC Life Sciences Payload (potential payback 243:1)
  - Management Risk: evaluated 15 processes using maturity model (accounted for 62% of overrun)
  - Integrated Cost-Risk Impact: identified $100M potential savings from risk mitigation investment of $5M
  - Process Improvements/Shared Learning: eliminated $20M at-risk cost through training and facilitation
  - Technical Performance Measures: basis for managing schedules, technology development, contigency reserves, etc.
- NASA ISS Flights 2A-7A (potential payback 172:1)
  - Pareto Analysis Risk Impact: of 91 identified risks, 12 accounted for 80% of the impact: basis for logically prioritized, focused, cost-effective risk mitigation
  - Critical Path Risk Impact : probability of task being on critical path affected by risks: basis for improved critical task control
  - Work Effort versus Program Milestones Risk Impact: most risks affect tasks not on critical path, driving cost rather than completion date (basis for resource conservation by selective risk acceptance)

RBDS Process for Life Sciences Payload



Faster, better, cheaper demands both technical and management innovations

RBDS Process for ISS



The process is predictive, quantitative, and experience-based

Value and Benefits Summary

- Futron offerings are strategic to JPL's future
  - Potential community-wide improvements (risk management, decision-making, & resource utilization)
  - Facilitates transition from industrial age to information age methods & technology
  - Promotes faster, better, cheaper innovations
  - Satisfy demands for more business-like strategy
- Possible opportunities to impact the JPL community
  - Establish and implement RBDS as a JPL standard
  - Utilize R&D portfolio management to improve organizational performance
  - Apply integrated architectural assessments model for trading off advanced exploration concepts

Futron's services pay for themselves by generating value far in excess of cost